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Shaping the STATE of Our Energy Future

Induced Seismicity Workgroup

Webinar – Rollout of Preliminary Draft of "Primer"

May 28, 2015

www.statesfirstinitiative.org

#States1st

WEBINAR AGENDA

• Introductory Comments	5-min	GWPC/IOGCC
• Document Overview	15-min	RS / RB
• Schedule	5-min	RB
• Review Guidance & Instructions	15-min	RB
• Questions & Answers	20-min	All

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Introductory Comments

- The States First Initiative
- Formed as a result of the collaboration of the Ground Water Protection Council and the Interstate Oil and Gas Compact Commission
- Rising levels of concern among public led to quick actions by the States
- The **Induced Seismicity Work Group** is a State-led collaborative effort to address concerns associated with induced seismicity

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Introductory Comments

- The *ISWG Members* are representatives from the State Agencies
- The *ISWG Technical Advisors* are subject matter experts representing federal agencies, environmental organizations, oil and gas companies, and universities and research organizations
- The ISWG consists of 93 involved participants representing a broad cross-section of stakeholders
- The ISWG Co-Chairs are Mr. Rick Simmers (Ohio Department of Natural Resources) & Mr. Rex Buchanan (Kansas Geological Survey)

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Introductory Comments

In 2014, the ISWG identified four areas of focus that could substantially benefit from improved public knowledge and sharing of common observations & learnings across stakeholder groups:

- Ground Motion
- Seismic Monitoring
- Data Sharing
- Evaluation and Response (formerly Traffic Light Systems)

Introductory Comments

- In January 2015, the ISWG Members chartered development of a “Primer” document to summarize knowledge and share learnings
- Four Sub-Groups formally formed in February 2015 to develop detailed outline and content for Primer
- Sub-Groups developed to provide cross-disciplinary technical perspectives across the engaged stakeholder groups
- Development of Primer focuses importance of communicating effectively with all constituents on issues related to induced seismicity

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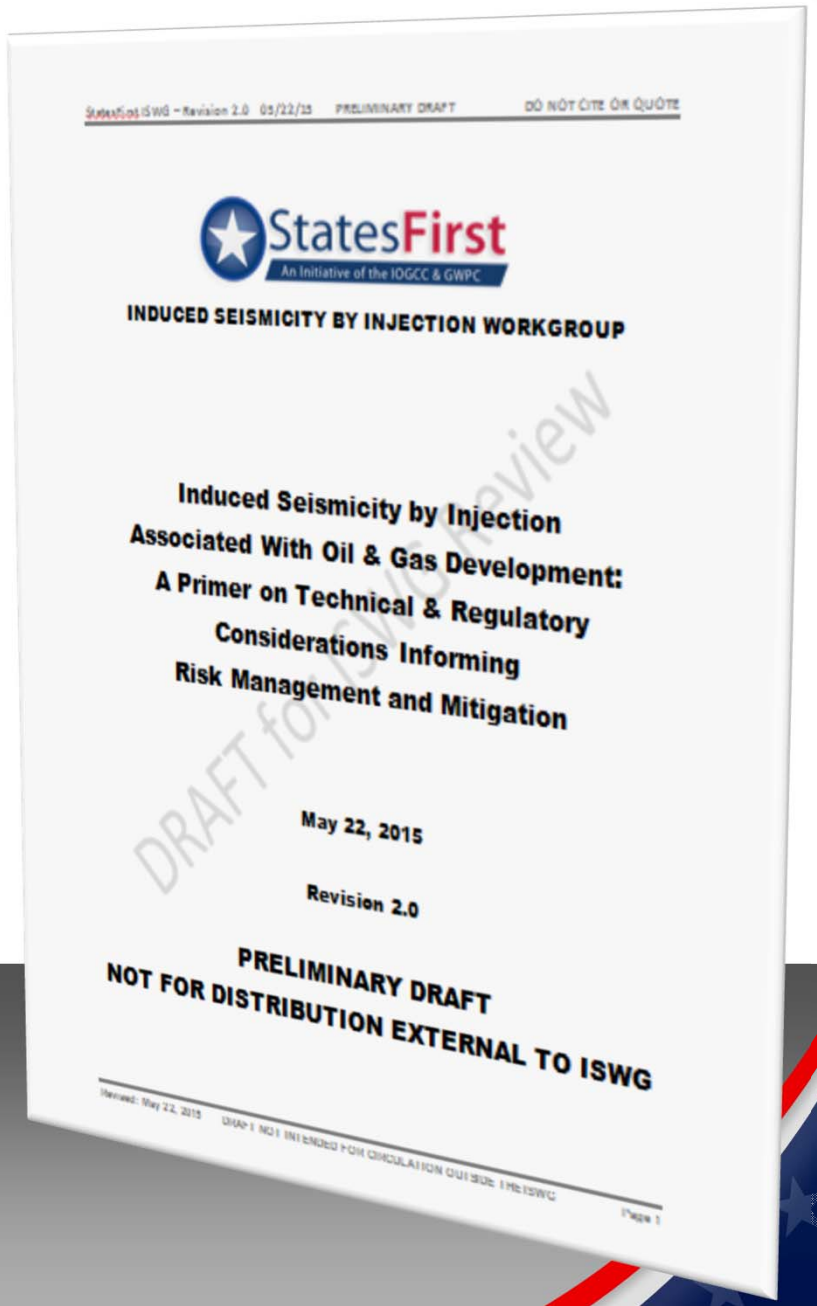
Document Overview



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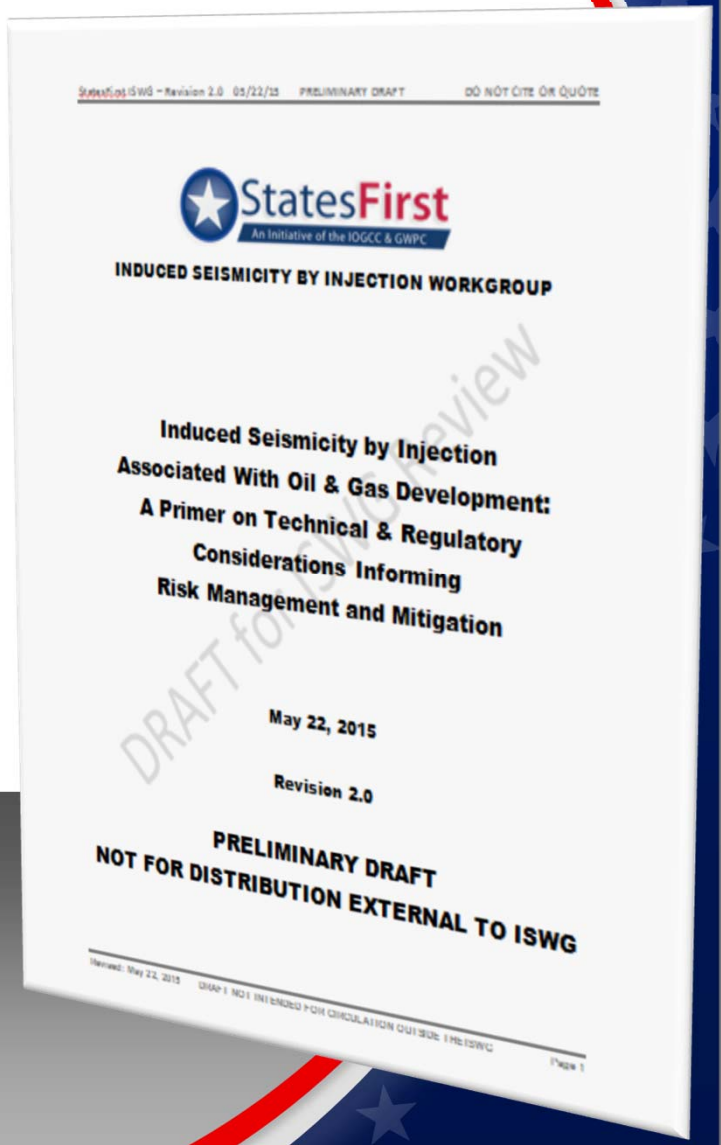
Document Overview

- Primary emphasis on UIC Class II disposal wells
- Includes some discussion of well completions & hydraulic fracturing
- Informational document only and is not intended to offer recommended rules or regulations
- Guide for better understanding and responding to anomalous seismicity
- Options available for risk assessment and management approaches
- Considerations for public engagement and response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INDUCED SEISMICITY BY INJECTION WORKGROUP

Induced Seismicity by Injection Associated With Oil & Gas Development: A Primer on Technical & Regulatory Considerations Informing Risk Management and Mitigation

May 22, 2015

Revision 2.0

PRELIMINARY DRAFT
NOT FOR DISTRIBUTION EXTERNAL TO ISWG

DRAFT for ISWG review

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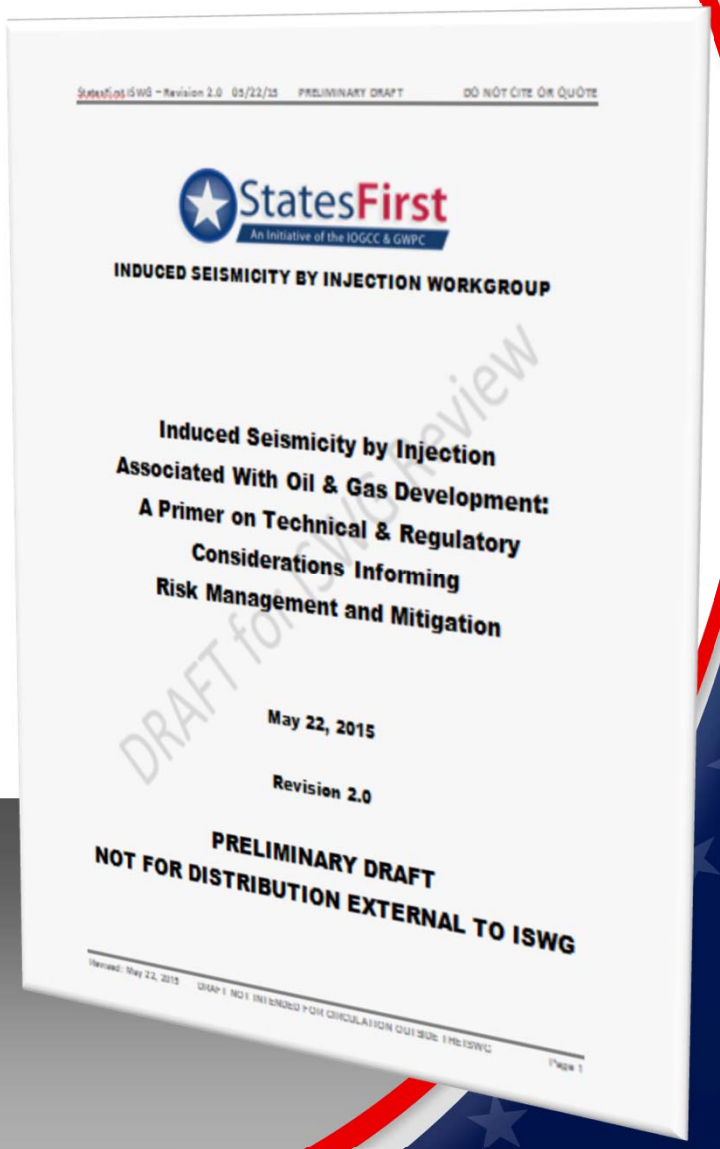
Document Overview

- Not an attempt to dictate approaches
- Intended to identify and present options for states that can be adapted to individual conditions and restrictions
- Flexibility is a hallmark of the effort and a fundamental strength of state governance
- Serves as a model for approaching emerging issues


StatesFirst ISWG – Revision 2.0 05/22/15 PRELIMINARY DRAFT DO NOT CITE OR QUOTE

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INDUCED SEISMICITY BY INJECTION WORKGROUP

Induced Seismicity by Injection Associated With Oil & Gas Development: A Primer on Technical & Regulatory Considerations Informing Risk Management and Mitigation

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Revised: May 22, 2015 DRAFT NOT INTENDED FOR CIRCULATION OUTSIDE THE ISWG Page 1

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Document Overview

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Document Overview

StatesFirst ISWG – Revision 2.0 05/22/15 PRELIMINARY DRAFT DO NOT CITE OR QUOTE

Schedule for Primer Development

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Schedule for Primer Development

- May 26 — Revision 2.0 sent to ISWG participants
- May 28 — Webinar for ISWG participants, Review Instructions
- June 15 — Full working group response to questions
- June 15-July 1 — Editorial Committee draft Revision 3.0
- July 1-July 15 — Professional and Technical Editor review
- July 15- Aug.15 — Independent Technical Review
- Aug. 15- Sept. 1 — Editorial Committee draft Final Revision
- Sep. 28 — Primer released in OKC

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Review Guidance & Instructions

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Review Guidance & Instructions

SPECIAL MESSAGE FROM THE CO-CHAIRS SOLICITING ISWG PARTICIPANT REVIEW

As an ISWG Participant, your contributions and involvement to date have enabled the substantial progress in developing the preliminary draft of the Primer.

The ISWG Co-Chairs greatly appreciate the efforts of all ISWG participants to reach this major milestone.

The next key step is your engagement to provide your review of the preliminary draft of the Primer document.

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Review Guidance & Instructions

The ISWG "Editorial Committee" will responsible for coordinating and facilitating revisions to the document

State Agency Representatives

- Rick Simmers & Bob Worstall – OH O&G
- Rex Buchanan – KS GS
- Tim Baker & Charles Lord – OK O&G
- Leslie Savage & Craig Pearson – TX O&G
- Herschel McDivitt – IN O&G

Technical Advisory Representatives

- Hal Macartney - Pioneer
- Kris Nygaard – ExxonMobil
- Ed Steele - GE Global Research Oil & Gas Tech. Center
- Ivan Wong – URS Seismic Hazards Group

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Review Guidance & Instructions

In the coming weeks, the Editorial Committee, Professional & Technical Reviews will focus on:

- Ensuring all technical terms listed in glossary and clearly defined
- Avoiding redundancy and repetition of information
- Ensuring references are appropriately cited and labeled consistently
- Further unify writing style and flow for section, and be consistent with style used for complete document

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Review Guidance & Instructions

For the ISWG Participant Review, please consider the following key points to aid development of your review:

- Focus your efforts on responding to the specific Review Questions provided.
- The ISWG Editorial Committee suggest that you do not expend any efforts on “wordsmithing” involving grammar, flow, or writing style comments as further editorial revisions will occur in parallel with this review step.
- Provide your comments by directly editing the provided Microsoft Word template in the space below each question you wish to respond and provide feedback on.

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Review Guidance & Instructions

- In order to be considered, all reviews ***must be provided in Microsoft Word format*** **using the template provided** which contains the “Review Questions” and please append your initials to the Microsoft Word filename when submitting

  Note: this requirement is to enable the ISWG Editorial Committee to efficiently collect and consider all of the comments.

- In order to be considered, all reviews ***must be submitted by June 15, 2015 5pm CDT*** to Mr. Ben Grunewald at ben@gwpc.org

- The ISWG Editorial Committee will not be able to consider any reviews submitted after June 15, 2015 or in any form other than the Microsoft Word format and template provided.

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Review Questions

1. Primary Technical Content

The ISWG has focused on four key technical areas as provided in Sections 5 – 8 of the Primer. These four areas are: (a) Ground Motion, (b) Monitoring, (c) Data / Information, and (d) Mitigation and Response.

a. Is the information contained in these sections effectively capture what is current state of information and knowledge associated with these topics? If not, please identify which section(s) of the Primer may not effectively capture the current state of information and knowledge, and please comment on specific additional knowledge or information that should be included, and please provide appropriate references for sources of this additional knowledge and information.

b. Is all of the information contained in these sections technically accurate? If not, please identify which section(s) of the Primer may not be technically accurate, and please comment on what changes should be made to provide technical accuracy.

c. As an informational document, the Primer is not intended to offer recommended rules or regulations; has content of Sections 4-8 appeared to meet this objective ? If not, please identify any areas of text that may be construed as recommending rules or regulations.

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Review Questions

2. Content & Discussion in Section 4 “Background & Issues Overview”

The ISWG has focused Section 4 on providing an overview and summary discussion of geology, earthquakes, induced seismicity, “Faults-of-Concern”, earthquake hazards, key findings of the National Research Council’s (2012) report, the US Department of Energy protocol for enhanced geothermal systems, the EPA (2015) report, the USGS (2015) preliminary hazard map report, methods for assessing “causation”, and risk management approaches.

a. Does the information contained in these sub-sections of Section 4 effectively summarize the key concepts and conclusions associated with each topic? If not, please identify the specific topic which may not effectively summarize the key concepts and conclusions, and please comment on specific additional key concepts and conclusions that should be considered for inclusion, and please provide additional references as appropriate.

b. Is all of the information contained in Section 4 accurately summarized and/or portrayed? If not, please identify which areas of Section 4 may not be accurately summarized and/or portrayed, and please comment on what changes should be considered to improve summary.

c. Are the major key references associated with each topic included? If not, please identify any additional major references that should be considered to provide an effective overview and summary discussion of the topics in Section 4.

Review Questions

3. Content of Section 9.0 “Considerations for External Communication & Engagement”

Given the complexity of the issue and heightened public concerns surrounding the issue, a section on considerations for external communication and engagement is included.

a. Does the information described in Section 9 provide effective and balanced overview from all perspectives, including regulatory, industry, NGO, and public perspectives? If not, please identify how Section 9 may be improved to enhance the content.

b. Does the information described in Section 9 complete and accurate from all perspectives, including regulatory, industry, NGO, and public perspectives? If not, please identify how Section 9 may be improved to enhance the content.

Review Questions

4. Content of Section 10.0 “Considerations for Well Completions & Hydraulic Fracturing”

While the emphasis of the Primer has been on UIC Class II disposal wells, given the broad public interest and discussion of “hydraulic fracturing”, Section 10 is included to provide state-of-knowledge related to hydraulic fracturing and potential for induced seismicity.

a. Is all of the information contained in Section 10 accurately summarized and/or portrayed? If not, please identify which areas of Section 10 may not be accurately summarized and/or portrayed, and please comment on what changes should be considered to improve summary.

b. Are the major key references associated with hydraulic fracturing included? If not, please identify any additional major references that should be considered to provide an effective overview and summary discussion of the topics in Section 10.

Review Questions

5. General Comments

If there are any additional comments that you may have to share with the ISWG Editorial Committee, please summarize these below, with appropriate reference to Section and page number, with your comment and/or suggested revision.

Special Request

As was discussed during the May 18th Salt Lake City meeting, the ISWG Co-Chairs respectfully request that you please do not further distribute this draft document.

This reason for this is the Primer, in current Revision 2.0 form, is still is a substantial work-in-progress, and will undergo significant editorial revisions during the next round of reviews.

Your consideration and adherence to this request is appreciated.

QUESTIONS ?

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ADDITIONAL REFERENCE

SUMMARY OF ISWG PARTICIPANTS

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SECTION 4 Background & Overview

PARTICIPANT SUMMARY

- 1 GWPC
- 1 Industry

PARTICIPANT LIST

- Joe Lee / GWPC
- Kris Nygaard / ExxonMobil Upstream Research

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SECTION 5 Ground Motion

PARTICIPANT SUMMARY

- 8 State Agencies
- 1 Federal Agencies
- 1 Research/Academia
- 6 Industry
- 1 NGO

PARTICIPANT LIST

- Larry Bengal / Arkansas O&G
- Herschel McDivitt / Indiana O&G
- Rick Simmers / OH DNR
- Robert Worstall / OH DNR
- Andrew Adgate / OH DNR
- Justin Rubenstein/ USGS
- Brad Bacon/ PDC Energy
- Mike Mathis / Continental
- Roger Kelley / Continental
- Ivan Wong / Seismic Hazards Group
- Leslie Savage / Texas Railroad Comm
- Scott Anderson / EDF
- Rex Buchanan / Kansas GS
- Jill Cooper / Anadarko
- Matt Skinner / OCC
- Carlos Cabarcas / Hilcorp

SECTION 6 Monitoring

PARTICIPANT SUMMARY

- 9 State Agencies
- 2 Federal Agencies
- 2 Research/Academia
- 10 Industry
- 1 NGO

PARTICIPANT LIST

- Larry Bengal / Arkansas O&G
- Rick Simmers / OH DNR
- Michael Teague / OK Sec of Energy & Enviro
- Bob Koehler / Colorado O&G
- Robert Bauer / Illinois Geological Survey
- Leslie Savage / Texas Railroad
- Mike Sims / Texas Railroad
- Nancy Dorsey/ EPA
- Scott Anderson / EDF
- Rod Gertson / Devon Energy
- Kara Williams / Chesapeake
- Tim Tyrrell / XTO Energy
- Hal Macartney / Pioneer Natural Resources
- Derek Smith / Rex Energy
- Norm Warpinski / Pinnacle
- Laura Swafford / Chevron
- Mike Mathis / Continental
- Roger Kelley / Continental
- Ed Steele / GE Global
- Dan Arthur / ALL Consulting
- Holly Green / EPA
- Kate Konschnik / Harvard Law
- Rex Buchanan / Kansas Geological Survey
- Jill Cooper / Anadarko
- Matt Skinner / OCC

SECTION 7 Data & Information

PARTICIPANT SUMMARY

- 6 State Agencies
- 4 Federal Agencies
- 1 Research/Academia
- 7 Industry
- 2 NGO's

PARTICIPANT LIST

1. Scott Anderson / EDF
2. Bill Bates / EPA
3. Larry Bengal / Arkansas O&G
4. Rex Buchanan/ Kansas GS
5. Jill Cooper / Anadarko
6. Dustin Crandall / NETL
7. Roger Kelley / Continental
8. James Kenney / EPA
9. Bob Koehler / Colorado O&G
10. Ernie Majer / LLBL
11. Mike Mathis / Continental
12. Jeff Nunn / Chevron
13. Kris Nygaard / ExxonMobil
14. John Rupp / Indiana GS
15. Bob Sandilos / Chevron
16. Leslie Savage / Texas Railroad
17. Matt Skinner / OCC
18. Robert Van Voorhees / UITC
19. Randi Walters / Stanford University
20. Brian Woodard/ Chesapeake

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SECTION 8 Evaluation & Response

PARTICIPANT SUMMARY

- 13 State Agencies
- 2 Federal Agencies
- 4 Research/Academia
- 10 Industry
- 1 NGO

PARTICIPANT LIST

- Brad Bacon / PDC Energy
- Tim Baker / OCC
- Robert Bauer / Illinois GS
- Larry Bengal / Arkansas O&G
- Grant Bromhal / NETL
- Jeff Bull / Chesapeake
- Diana Burns / Colorado O&G
- Ted Dohmen/ Hess
- Phil Dellinger / EPA
- Cliff Frohlich / University of Texas
- David Henry/ Hilcorp
- Ryan Hoffman/ KCC O&G
- Austin Holland / OK GS
- Roger Kelley / Continental
- Charles Lord / OCC
- Mike Mathis / Continental
- Linda McDonald / SandRidge
- Stephanie Meadows / API
- William Rish / Hull Risk Analysis Center
- John Rogers / Utah DNR
- Rick Simmers / Ohio DNR
- Mark Thiesee / Wyoming DEQ
- Randi Walters / Stanford University
- Ulrich Zimmer / Shell
- Mark Zoback / Stanford University
- Justin Furnace / Hilcorp
- Leslie Savage / Texas Railroad
- Scott Anderson / EDF
- Rex Buchanan / Kansas GS
- Jill Cooper / Anadarko
- Matt Skinner / OCC

SECTION 9 External Communication & Engagement

PARTICIPANT SUMMARY

- 1 State Agency
- 1 Industry

PARTICIPANT LIST

- Matt Skinner / OCC
- Jill Cooper / Anadarko

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SECTION 10 Well Completions and Hydraulic Fracturing

PARTICIPANT SUMMARY

- 3 Industry
- 1 Research/Academia

PARTICIPANT LIST

- Brad Bacon / PDC Energy
- Mike Brudzinski / Miami University
- Kris Nygaard / ExxonMobil Upstream Research
- Norm Warpinski / Pinnacle

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